629.1305
AIR

The Air Line Pilot

July, 1956

Automatic ATC Systems --- Page 5

The Cockpit Overfloweth --- Page 10

THE LIBRARY OF THE
JUL 18 1956
UNIVERSITY OF ILLINOIS

The F-27

The Pilot's Command Function

Mere Manual Technique Is No Longer The Only Criteria Of A Pilot. Experience, Mature Judgment And Responsibility Is Today A Necessity Of Command Function

By Capt. F. E. W. Smith
Canadian Air Line Pilots Assn.

In preceding chapters of this series airline pilotage has been described as a profession and its ethics outlined. The job has been shown as one which requires frequent application of judgment and proper acquittal of responsibility, rather than one which requires only manual techniques.

In the days when man first learned to fly, little more was attempted than to get up in the air and down again in one piece. Little more was possible, for the equipment was highly unreliable, knowledge of the air slight, and the hazards of flight great. Hard lessons were learned in what could, and could not, be done. The pilot's progress was measured largely in techniques and skills of control, which enabled safe flight and which steadily increased his ability to make use of the air.

Wide Expansion

For many years the industry has been beyond the pioneer stage and has been expanding quickly on frontiers of height, speed, weight, range and use. As we have gone into ever heavier and faster equipment, fly schedules more accurately and more often, the pilot's job has developed along lines, where the need for experience, mature judgment and responsibility is as important as is accurate flying. We have grown into men whose alphabet is our technique and who use such in the management or in the command of our flights. The captain of today is the commander of a ship of great value, of enormous earning power, which carries many passengers. The first officer is the second in command and needs the qualities of all such men elsewhere, be they on a ship, in a regiment, or in a business.

Responsibility

A job of command requires two things—responsibility and leadership. The first named is the first required, because it means acceptance of the job, for of course, if a man does not accept his job he will not do it and therefore will not be in command. In assuming responsibility, a man says in effect: "I will look after it," takes it as his own, releasing his superior to other worries. in his efforts he becomes responsible for everything concerning his job, including those who help him and to whom, within the limits of his authority, he further delegates. Thus the president of a corporation is responsible to his directors, who appointed him, and to all employees, who rely on him to lead wisely for the benefit of all.

Criticism is a necessary companion of responsibility which only the completely irresponsible may avoid. It is the habit of man, when faced with criticism, to pass the buck but this maneuver has doubtful value because of the indirect effects of lost respect and the reputation a "buck-passer" soon acquires. The first officer may have caused an "incident," and the captain can certainly criticize his incompetence. But if the matter goes further the captain is to blame because it occurred on his flight, he did not correct a developing situation, had apparently not given enough instruction to his first officer, or had mistakingly assumed him capable. These facts will remain, however ably he disclaims responsibility, and if he does both his superiors and his first officers will remember. The airline will not happily give him more responsibility and his capacity to govern first officers will be impaired.

In both quantitative and qualitative terms the responsibility of an airline captain is heavy. He is responsible for the operation of his equipment, which is very costly. As its operator he is a principal producer for his airline, because the aircraft produces all the revenue; because he can, by efficient operation, save operating cost; and because, by poor operation, bad judgment, or carelessness, he can cost them a lot both in direct expense and bad passenger relations. He can even destroy their investment and cause crippling expense in claims and lost faith. But what gives his responsibility its special qualitative value is that he holds the lives of his passenger in his hand. Responsibility for lives is a very distinct privilege.

Leadership

Leadership is vital to any command and requires men who possess a number of qualities, which may be grouped under the two headings of character and intelligence.

The cornerstone of character is a man's ethics, standards to which he holds himself accountable both as a person and in the conduct of his busi-

Vol. 25, No. 7

The Air Line Pilot

July, 1956

Ed Modes, Editor
Helmut Lorsch, Asst. Editor

Entered as Second Class Matter at the Post Office at Chicago, Ill. Copyright; 1956, by Air Line Pilots Association, International.

Clarence N. Sayen
President
Charles E. Beatley
First Vice-President
Kay McMurray
Executive Vice-President
F. A. Spencer
Secretary
D. J. Smith
Treasurer

REGIONAL VICE PRESIDENTS

C. C. Spencer, Jr. ..... Region I
R. J. Rohan ..... Region II
M. E. Swanson ..... Region III
N. G. Carper, Jr. ..... Region IV
W. H. Drummond ..... Region V

Larry Cates
Legislative Representative

Published Monthly by the Air Line Pilots Association, International, Affiliated with A. F. of L. Publication offices: 55th Street and Cicero Avenue, Chicago 38, Illinois.

Advertising appearing in this magazine cannot be construed as being an endorsement by the Air Line Pilots Association or the Air Line Pilots.

Opinions expressed by individual authors in The Air Line Pilot do not necessarily represent official ALPA opinion, unless specifically so stated, and therefore should not be construed as such.

Annual Subscription, $2.50

ness. All our actions revolve around these, our success depending largely on their quality and how conscientiously we apply them. Character also includes courage, not only the physical kind but that which enables a man to follow his convictions and to accept his defeats in good spirit.

An intelligent man is in constant search for knowledge, which he must have, if he is to grow wise. Good judgment, essential to command, is the intelligent application of knowledge; and decision, the executive quality, is the combination of judgment and courage. Organization, without which no command succeeds, is the application of intelligence to any task so that it is done logically and easily. An understanding of human nature is the possession of the wise, and when applied to a command assignment is the catalyst which really breeds success.

Principles Outlined

The airline captain has been given the responsibility of conducting his flight efficiently, safely, and with comfort to his passengers. What leadership does this demand?

We know the air as an ocean of variables, full of often unpredictable dangers. We know aircraft to be beautiful, wonderful, complicated, and sometimes untrustworthy machines, capable of putting us in positions of great difficulty without notice. We cannot command them through the atmosphere unless we know all we can about it and about them. The first demand is that we know our business, expert in all parts, for any weakness may be the Achilles heel which shall destroy us.

The second demand is for decision. We cannot fight an engine fire, a thunderstorm, ice, or navigational difficulty, by writing the chief pilot: "Your immediate attention and decision urgently requested." Often when we need them most, our people on the ground are powerless to help. A problem met at 300 mph must be faced squarely and solved on the spot.

In reaching decision, it is wise to seek such advice as is available, and sensible to follow it if it seems best. In respect to advice, it is a fact that the decisive nature, and the bullheaded nature, while separated by all the difference of intelligence to stupidity, are, at a moment of decision, often confused to be the same. Asking for and listening to advice is wise—following it may not be. Refusing to seek advice is never wise, refusing to follow it may be bullheaded and stupid—or may be the right thing to do.

Proper organization of his flight is leadership's third demand on an airline captain. And in his organization, because of this operating medium, he must have an excellence not required in most other undertakings.

Precedents

The obvious example of the pilot's organization is seen in the procedures, drills and techniques which he uses in normal control of his aircraft and in the handling of emergencies. These are all carefully planned for him, and it is not a good thing for him to vary them, or perform them sloppily, even if he personally doesn't agree they are the best attainable, for in all flights one pilot checks the other and crews constantly change. Innovation of procedure by a captain or a first officer may create confusion, and at most times in the air confusion is dangerous.

Modern flying presents a number of difficulties which did not exist, or were not important, in earlier days, for which the captain of today must definitely plan. Foremost among these is the traffic problem, the hazards of which are a worry of great importance to all airmen and aviation executives. While its ultimate solution may be found in electronic watch or control, the need of maintaining an effective lookout is very important today and will probably remain so in the future. In providing such it must be realized that the longer maximum vigilance is required, the less efficient the watchers become, and the less effective the watch. Captains need to keep this in mind and so organize themselves and their crews that they are most vigilant at times of greatest hazard. Paper work should not be done in busy terminal areas, a routine vigilance which is not wearying must be maintained in cruise and consciously increased prior to entering heavy traffic.

Fatigue Problem

Fatigue is an airman problem currently receiving a lot of attention but about which little is known. One fact common to all forms, however, is that it may be lessened if an individual can pace himself. Thus it is possible for a captain to so organize that his crew will have the energy for a maximum effort when such is normally required. There are a number of ways of pacing a crew in flight, all of which involve, in one way or another, breaking the tension of constant duty. Actual release of watch, as on properly equipped overseas flights, switching jobs for short times, taking a walk through the cabin, talking, even reading and listening to music, are some useful ways of delaying the onset of dangerous fatigue.

While such diversions have their use, they may, if the captain is not of definite mind, be abused and lead to careless flight and the destruction of discipline. A captain must maintain proper discipline in his crew, which does not mean he needs to be a marti-

On The Cover

F-27 readying for take-off shows unique high-wing design.

Widely regarded as the foremost contender for the DC-3 replacement role is the high-wing F-27 Friendship, developed by Fokker in Holland, and to be produced in this country by Fairchild Engine and Airplane Corp.

The twin-turboprop, powered by Rolls-Royce Model 506 Mark 511 Dart engines, geared to 12-foot Rotol propellers, will carry 40 passengers at 280 miles per hour.

According to the manufacturer, the F-27 can land in 3,800 feet of runway and is able to climb at the rate of 1,500 feet per minute at sea level.

Initial orders by a number of the nation's local service carriers has caused the Association's Engineering and Air Safety Department to institute the first routine steps for formulation of an ALPA Fokker Friendship F-27 Evaluation Committee.

net, but does mean he must impress on all the seriousness of the undertaking and the need for concentration. This he will not do if he allows crew members to follow their own ideas of what is right and proper.

Equal Treatment Stressed

Such breaks from duty as can be permitted must be divided equally, according to need, if morale is to remain high and efficiently maintained. A captain who pampers himself, will destroy in large measure the respect his crew members have for him, will damage their morale greatly, and will lower the overall efficiency of his crew by the imbalance he has imposed on the duties. A captain who does it all himself, who allows his crew many liberties in duty, is risking overtiring himself, courting loss of interest and inattention from his crew, and is running a flight no more efficient than is that of the other.

Complacency is another problem among aircrew, one which seems to come after a long time on one aircraft, on the same route, and a pacific experience. This is perhaps the most dangerous condition to plague a captain, more especially so since he is himself the most likely person affected. It is a mental condition which creeps up on one unawares and which requires a continuing interest in the business if it is to be prevented. The more a man can become immersed in the problems of command, the more effort he can put into completing difficult trips and the more perfection of technique he can expect from himself, the less likely is he to slip into the dangerous habits of complacency. The air must always have an airman's full respect.

A Team

A well-organized flight is one where all crew members know their jobs well and work together as a team. It is the captain's job to get his team operating properly, and in doing so he will naturally want all of his men to know as much as possible about their functions and about flight itself. He becomes a teacher in his effort to be a good crew leader.

As most crews consist of two pilots only, as the first officer is always the captain's right hand man, and as they are of the same profession, the first officer needs and gets the most attention. There are several good reasons why captains need to take genuine interest in the instruction of their first officers. The more able the co-pilot, the less load there is on the captain. Line flight is the only place where a first officer can learn his profession and practice his skill, as it is not economically feasible or even possible to give it all to him on off-line training. The safety of the flight demands full competence in the first officer because he may have to take over if the captain is, for some reason, incapacitated; and because it is quite possible to get into difficulty during flight where the captain must have the help of a fully proficient man.

Long-haul aircraft contain among their crews such specialists as navigators, engineers and radio operators who, while more expert in their field than is the captain, still need his training to properly integrate as a crew. He has the airmanship, a most vital knowledge, which they need to absorb to some degree if they are to be an asset on the flight. An appropriate comment—as their commander and teacher he must have a fair knowledge of their jobs, otherwise he will not be able to help them, teach them, or have real command of his flight.

The efficient conduct of the flight is the captain's responsibility. How well he does depends to a considerable extent on the effort and personal organization he puts into it. If well organized he will flight-plan carefully, taking full advantage of expected winds and weather conditions. He will be awake to all opportunities for safe but time-saving procedures, and will profit by any breaks in weather which he observes. He will do his utmost to provide a comfortable ride for his passengers, for their satisfaction is good business for the airline and for himself.

All men who must lead must know the importance of example. The word "leadership" means that others follow and to follow is to imitate. If the example set by the leader is bad, the following will be poor, too. This is pretty basic but it is amazing how many hold the position of leader and seem to give no thought to the example they set. As the commander of his flight—lord of the money-making equipment of his airline—the captain is an executive, who is watched and often followed by many; first officers, other crew members, mechanics, ramp men and passenger agents. His personal standards of dress and carriage, attitude towards his business and his employer, treatment of passengers and standard of courtesy and consideration, should be high. If so, others will hold him in greater respect, follow him willingly, and listen to him. Why is the colonel of the regiment such a smart and upright soldier?

Human Relations

The science of human relations, long ignored by man in his dealings with men, is today generally considered important to successful management. It is knowledge which pilots, captains and first officers alike, should possess, but it is much too big a subject to deal with here beyond the bare outline of a few basic truths. Good human relations means getting on well with other people, whether they are just people, or have a relationship such as with superiors, colleagues, or subordinates.

It is an axiom that if everyone could look at the facts alone, leaving out emotions, all problems between people would be easily solved. It is also fact that reason and emotion are so interwoven in our minds that practically no one can divorce emotion from the opinions, beliefs and decisions we hold and take. Ability in human relations, therefore, demands emotional control and emotional understanding, so that as far as possible unfavorable emotional reactions will be controlled and not induced in others.

Some emotions, which we wish to suppress in ourselves and do not like to see in others with whom we are dealing are fear, anger, dislike, envy, distrust and opposition. Some we want to encourage are friendship, trust, security, cooperation and interest. There is an enormous difference between a relationship dominated by the former and one by the latter. We want to try to avoid passing an emotional buck. A captain, who has been blasted by his wife, may take it out on his first officer, who may in turn pass it on to his wife. Good humor and kindliness are two great aids to a good human relationship; arrogance and temper are two great enemies.

The emotional needs of people must be fed, and if well nourished will flourish. Everyone needs respect, acceptance, honest treatment, proper credit for accomplishments, friendship and a little fun. If the commander sees that his people get these, he will find his task of leadership vastly eased.

The First Officer

The main difference between captain and first officer status is that the former enjoys a great deal of freedom, initiative and actual command in his position and need not feel any urge to strive higher. The latter has not such prerequisites and should naturally envy and desire the captain's post. But no one is ever fitted to command until he has learned how to be commanded; before one can lead, one must learn to follow. This the first officer does, and in his years as co-pilot absorbs the convictions and feelings he will need

(Continued On Page 13)

Specifics For A Useable ATC System

Here The Author Lists The Specific Requirements For An Immediately Useable Air Traffic Control System. An ALPA Air Safety Forum Report

By S. P. Saint
Air Traffic Consultant, ATA

It is time we got serious about Automatic Air Traffic Control. We need automatic machines to speed up the routine functions of control. We need such machines to keep the mushrooming ATC operation safe.

On a typical IFR day in 1956 there are frequently more than 50 flying machines in the air within a 50 mile radius of the Empire State Building in New York. These aircraft will range from helicopters to DC-7's and military jets. They fly on some 1250 miles of interweaving airways through 83 intersections and points of convergence, climbing and descending at different speeds on several hundred different route combinations to interconnect three major and seven minor airports within eleven en route airways.

In the towers and center there will be 97 controllers and assistants worrying about what goes on in this 50 mile radius area of confusion. Seventy-two radio frequencies will be in use, many of them so loaded that a pilot can't get a word in edgeways.

Need Is Immediate

We need to start building an automatic air traffic control system. It must be electronically tied into the military SAGE System of air defense. It must be capable of evolutionary, step by step application. Above all it must come into being quickly.

Let me define what I mean by Automatic Air Traffic Control: In the system I visualize, aircraft will report position automatically. A machine on the ground will analyze control data automatically. Routine clearances will be automatically prepared and transmitted to the cockpit for display on a visual indicator.

The automatic system we need is not a system that replaces the human judgment of either pilots or controllers. Quite the contrary. It should relieve the pilot and controller of the routine, repetitious functions of control. This will permit even greater freedom in the exercise of human judgment when this is required.

There must be no compromise with the pilot's prerogative to say when a flight will operate to what destination. The pilot must have complete freedom to say when a flight will divert to an alternate. This responsibility is his alone. It cannot be shared with ATC.

Specific Requirements

In this brief article I will outline what I believe to be the specific requirements and principles on which the needed system must be built. These requirements and principles are based on existing policy of both the Air Coordinating Committee and the RTCA. I freely admit, however, that this proposal goes beyond existing policy in making firm decisions on operational points that the policy makers have left up in the air. I make no apology for this. You cannot build electronic hardware without first deciding exactly what it must do.

A system designed to meet the requirements I will outline, can be implemented in an evolutionary way. Such a system can be electronically married to the SAGE defense system and logically will make use of elements of the SAGE system to avoid duplication. A system designed to meet these requirements can provide closely coordinated logistic support of combat operations in a defense emergency.

The proposed requirements I am submitting are made in the form of suggestion to the CAA, the ANDB and the military and civil user agencies concerned. It is fitting that these should first be presented to the airline pilots. Their collective judgment as to the merit of this approach should be sought at the outset.

I firmly believe that acceptance of these requirements, if followed by an aggressive development program, could lead to prototype hardware for flight testing within one year of the day work was started. I should like to point out here that in most of what I am suggesting the ideas are not my own. They are the collective work of many people over a period of years. I am pulling this material together and suggesting specific decisions on points that have not yet been nailed down. I have no pride of authorship. I say only that we have got to move. Time has run out. I sincerely believe that what I am proposing is the simplest and best and most practical approach to this nasty problem.

Operational Requirements

The operational requirements that the future air traffic control system must meet can be simply stated:

- The system must provide 60 landings and 60 take-offs per hour on dual runway airports. The system must be capable of double this capacity in event of military emergency.
- The system must provide full, non-interfering use of airports as close together as those presently used in the New York area. (I am excepting Floyd Bennett Field.)
- The system must allow flights to climb, cruise and descend within the normal best performance ranges of the various aircraft types.
- When the flow of traffic to a runway has been interrupted by weather or other cause, the system should be capable of absorbing the interrupted flights in safe holding positions. When the runway is re-opened, the system should be capable of re-establishing a full flow of traffic to the runway, in approximately the original priority order within four minutes.
- Provision must be made to divert flights singly or in groups from one airport to other airports at the request of the pilot or aircraft operator and without requiring advance notice.
- Overshoots, aircraft needing to return after take-off and other emergencies must be fed back into the landing stream without delay and without reduction of the full rate of traffic flow to the runway.
- Jets must not be held below 20,000 feet except in emergency.
- Jet and piston types must be mingled in the landing sequence with no reduction in the landing rate.
- Where a single runway must be used for both take-offs and landings, the system must be capable of opening

up precise intervals in the landing stream for take-offs. It should not require more than four minutes advance notice to open an exact interval in the landing stream for a take-off.

▶ Whenever delay in the system is unavoidable and can be predicted in advance, the system should allow a pilot to take the anticipated delay on the ground before take-off. Note that the word here is "allow." The pilot should be "allowed" to choose whether to: (1) take the delay on the ground prior to take-off; (2) take the delay by cruising slower en route; or (3) take the delay by cruising at normal speed and holding in a free area near the terminal area of destination.

▶ The system must not suffer a loss of capacity or efficiency on reaching saturation, whether such saturation is caused by an excess of traffic demand or by an unexpected reduction of runway capacity. In other words, the system must inherently prevent any tendency to form a log jam.

▶ The system must handle aircraft that do not have the necessary airborne end of the new system. The new system must provide operational advantages in proportion to the number of equipped aircraft.

No Dream

These requirements may sound like asking for the moon on a silver platter. They may sound contradictory. I sincerely believe all of these requirements can be met with procedures that will be operationally acceptable. Further, I believe that the electronic hardware needed to implement this operational philosophy can be quickly built within practical limits of cost, weight and technical complexity.

Traffic Flow Control

Traffic Flow in the system must be controlled in accordance with five basic principles:

▶ Operational control, the authority over initiation, continuation, diversion or termination of a flight. Operational control must remain absolutely and completely, as it is today, the prerogative of the pilot or aircraft operator. This basic principle applies equally to military and civil operations. This is clearly stated ACC policy. (The Air Coordinating Committee Report, "Air Traffic Control and the National Security," (SWG-5), dated December, 1950.)

▶ Air traffic movement must be directed by a single authoritative agency on the ground. Air traffic has always been controlled this way. In 1948 SC-31 (The report of Special Committee 31 of the Radio Technical Committee for Aeronautics, titled, "Air Traffic Control," dated May 12, 1948.) declared this principle to be best even for the so-called "ultimate" system. There has been no serious disagreement on this question since it was thrashed out (with some of Winston Churchill's blood, sweat and tears) in SC-31.

▶ The priority of traffic movement into congested airports must be determined on the basis of equal distribution of delay. This is also accepted and agreed Air Coordinating Committee (SWG-5) policy. "Delay" is a nasty word. I wish we could talk about a system in which there never would be any delay. Certainly the main effort of traffic control development should be concentrated on increasing the traffic handling capacity of the system so that everyone can fly when he wants to.

Delay Factors

Unfortunately, however, several factors conspire to make congestion and delay inescapable under some conditions. Congressmen, the Boards of Directors of airlines, City Fathers—the people who supply the money for improvements, rarely can be persuaded to part with the long green until a bad situation has become intolerable. Improvements always lag behind demand. Furthermore, such things as wind and weather and snowflakes and flat tires sometimes conspire to cut the capacity of the control system. On top of all this, businessmen have a nasty habit of wanting to get home for dinner on Friday evening.

Let's face it, a practical control system must cope with the situation when more people want to go to airport "X" than airport "X" can handle.

So, if more pilots request to arrive at Chicago Midway than Midway can handle, how do we decide who goes and who doesn't? We pilots actually answered this question automatically when we insisted on retaining operational control. When we refused to let the control agency tell us when a trip could operate and when it had to be cancelled or diverted, we ruled out all arbitrary methods of Flow Control. If the pilots are to retain Operational Control, priority cannot be established on the basis of the length of a flight, the time of filing a flight plan, the type of aircraft, or the class of user. There is only one way remaining: equal distribution of delay. When each flight is given the same delay, the pilot or operator of each aircraft will then decide for himself whether to pay the price (in terms of delay) and operate, or whether to cancel or divert.

Jets Cannot Stand Delays

This, of course, means that landing times cannot be absolutely guaranteed. Let me hasten to admit, however, that the economics of jet operation demand that air delay be effectively eliminated. For the jet we must come reasonably close to guaranteeing a landing time. This we can do. The method was spelled out by SWG-5 in 1950. This method of Flow Regulation, based on equal distribution of delay, still stands as accepted Air Coordinating Committee Policy. The future automatic air traffic control system should be based on this clearly stated ACC Policy.

▶ The fourth basic principle is this: A reservoir for traffic must be available in the terminal area to absorb short period fluctuations to insure a full flow of traffic to the available runways. It should be pointed out, however, that no flight will be delayed in this terminal area reservoir just to make the system work. If you are delayed in the reservoir (approach stack) this is delay that you would have had to take somewhere anyhow. In fact, provision of buffer feeding stacks will reduce delays by making the system more efficient.

Operational requirements stated earlier, emphasized the need to handle unexpected diversions, emergencies, weather interruptions, and the like without losing any available runway time. These requirements make a reservoir or pressure equalizer tank close to the runway a fundamental necessity. These same requirements lead to the fifth basic principle relating to traffic flow. It is this:

▶ Final, irrevocable determination of landing sequence should be accomplished as close to the landing runway as possible. In no case should this be more than four minutes before touchdown. This principle is already functioning effectively in the radar approach control operation at Washington, Chicago and elsewhere. Its continuation is a fundamental underlying principle required to maintain the needed flexibility in Air Traffic Control.

Flow Element Of The System

Let me describe now, briefly, how traffic can be controlled to meet the foregoing principles and requirements. This is the question of how random requests (from long-haul flights, locals, itinerants, jets and pistons) are converted finally to a precisely controlled stream of traffic to the landing runway. Traffic flow to a particular runway is smoothed out in three stages.

Before I describe the first of these three stages, I would like to underscore this comment: I refer to Flow Regulation as a first stage only because it is the first element of the flow system a flight will be concerned with in the ultimate system. It is definitely not the first element of the flow system to be implemented. It should be the last. Flow Regulation is not the heart or main building block of the ultimate system. It is an element to be superimposed later, if and when needed.

We can and should so increase the traffic handling capacity of the system that Flow Regulation will be unnecessary for years to come. We must, however, understand and tell development people what kind of Flow Regulation is operationally acceptable. Without this understanding long-range development cannot proceed on a firm basis.

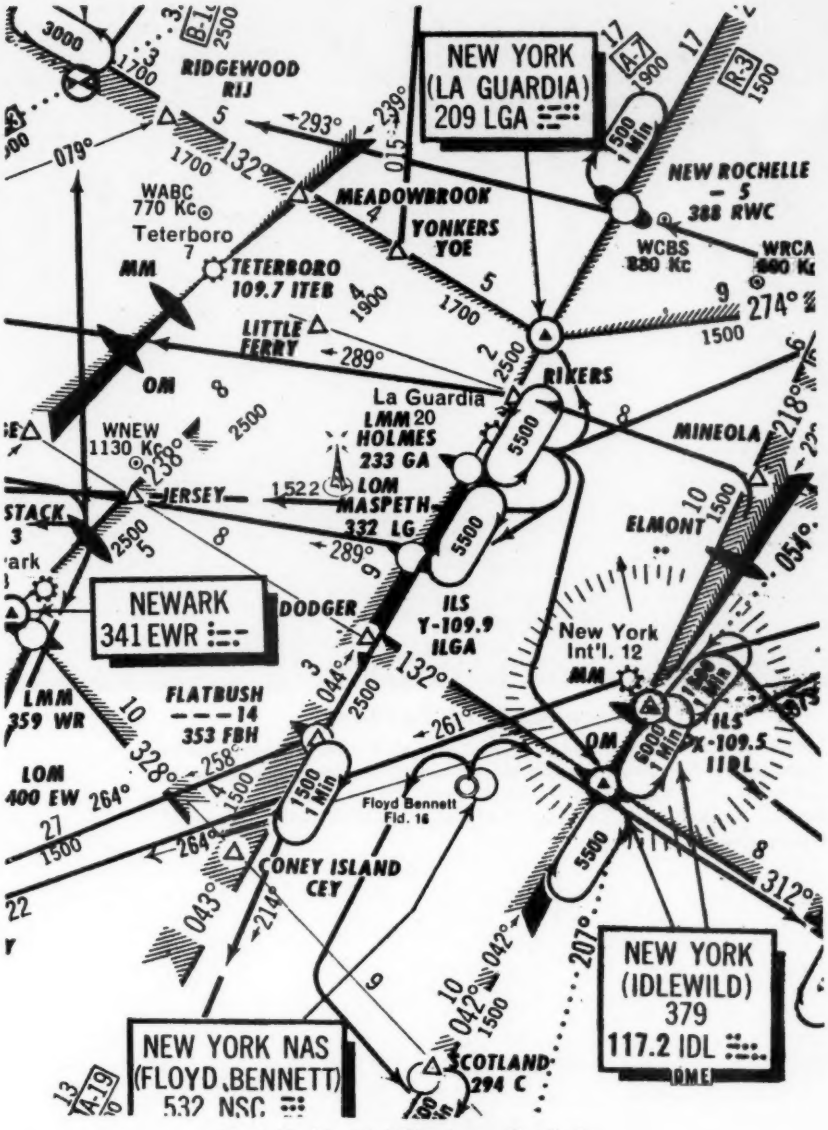
SWG-5 Method

So, in the first (and we hope unneeded) stage by which random requests are smoothed into perfect flow to the runway, is the SWG-5 method of Flow Regulation. This controls the average rate of traffic entering the terminal area of destination. This method establishes the priority of entry to the terminal area on the basis of equal distribution of delay. The way this is done is described in detail in the Air Coordinating Committee (SWG-5) document, "Air Traffic Control and the National Security."

This method of "metering traffic" into the terminal area is relaxed because it does not have to match the runway acceptance rate exactly. The backlog of traffic in the terminal area —the reservoir—will smooth out the continual small differences between traffic flow through entrance gates to the terminal area and the flow of traffic to the runways of the area.

The second stage by which the Flow of Traffic to the runway is smoothed out works as follows: As the flight enters the terminal area at cruising speed, the control system will automatically compute the time at which the flight should slow down. If the flight is early the speed reduction will be made early. If the flight is late the higher speed will be maintained until the flight is close in.

This is a logical intermediate step to narrow down the arrival time and minimize the possibility of holding in the Terminal Area reservoir. In a system built to meet these requirements this would be a simple calculation. The pilot would be advised when to slow down by visual signal in the cockpit.



New York's 50-Mile Area Confusion.

The third and final stage by which traffic is pressed into an exactly spaced flow to the runway will be accomplished by a modification of the military VOLSCAN type of computer. An automatic radar tracking circuit will be locked onto each aircraft's radar target as it leaves one of several close in approach fixes. The specific flight path will then be directed by automatic signals. The flight path will be lengthened or shortened as required to take the last of the slack out of the system.

The military has already demonstrated an accuracy of 9 seconds in positioning individual flights on final approach. This accuracy may be further improved. There appears to be little doubt that a runway will be used more efficiently under full control than it can now be used under ideal VFR conditions.

Air Space Use And Safe Separation

For convenience in explanation I have separated out and discussed the traffic flow features of the system separately. It is now time to discuss three more principles that relate to airspace use and safe separation of traffic.

▶ The sixth basic principle deals with the question of routes. Should air traffic control be based on an orderly system of routes planned and published

(Continued On Page 14)

The ALPA

27th Aero-Medical Convention

Held April 16-18 in Chicago. L. to r. Capt. H. W. Orlady, Chairman, ALPA Physical Standards Committee; Dr. T. A. Coates, CAA Medical Examiner; Dr. G. Kidera, Medical Director, UAL; Dr. G. Backenstoe, Retiring President, Civil Aviation Medical Association.

Safety ward

TWA First Officer Perry Schreffler, w of Sec lac El Dorado Convertible tail ligh ub—in Plan. Award is presented by Capt. obert Ac Safety Chairman (left).

NWA MEC

New C's
PAA C

PA Camera

Safety ward

effler, w of Second Prize—a 1956 Cadil-
tail ligh ub—in ALPA Safety Suggestion
y Capt. bert Adickes, TWA Central Air

Electra Mockup

ALPA Lockheed Electra Committee, during recent inspection trip to Electra mockup at Lockheed plant, meet with company engineers.

New C's
PAA C

NAL MEC

. . . And The Cockpit Overfloweth

Soon, Progress Will Have Imposed So Many Complications In The Cockpit, The Pilot's Theme Song Will Be "Pop Goes The Weasel"

By Dave ('Gimmie-Room') Kuhn, TWA

Soon, if not already, progress in commercial aviation will have imposed so many complications on the pilots at the controls that the work load will exceed the capabilities of human comprehension. Then "Pop Goes the Weasel."

These observations are not intended to direct criticism for growing pains at any specific group. We pilots are more than enthused with the rapid growth of an industry we started. However, when the tilt signal is apparent, it is none too early to point out dangers that joint effort can rectify. A pilot's mind can focus on just so much. Place additional requirements in the cockpit and there is apt to be a mental blackout.

To Each His Own

Our modern air-transport is a product of not one but many minds. Each engineer considers only his phase and naturally promotes same. The engine builders want more power; the airframe engineer more speed and payload; the electrical boys can prove that all flight instruments must have current to be accurate; added engine instruments are a must; miles and miles of wires are needed to run motors that run motors that actuate hydraulics; pressures, lights, bells, buzzers, horns, radios, blowers, controls, brakes, fans, and hundreds of other movable or unmovable parts. There are hundreds of fuses, circuit breakers and fail-safe gimmicks that need looking at. I shall not delve deeply into this for fear of revealing ignorance on what I am supposed to know. Needless to say, the electrical engineers have done one hell of a job peddling their product. A pilot flying four or five different types of equipment is fortunate if he can determine where and how to turn things on and off. Simplification and standardization are balihooed at Engineering Meetings and Safety Forums. The product given to the pilot is something else.

The Gimmicks

The DC-3 has been declared unairworthy because it does not meet the T category or performance test as amended from time to time by the CAA. Yet it (DC-3) had little difficulty getting in or out of airports. The simple hydraulic plumbing gave little or no trouble. The modern transport passes the requirements. However, on a given runway, if the outside air is above the critical temperature, a reduction in gross weight must be made for each degree such temperature is exceeded. But wait—our charts say for each knot of headwind, some weight can be added. This poses some rapid calculations on the pilot's part, in a variable wind condition, especially when he is told to expedite his takeoff. Linked with this, of course, is the requirement for automatic feathering. This device can react much faster than a pilot and oftimes does when least expected. There is more than a growing suspicion it has killed more than it has saved.

Landing is the take-off in reverse. Weight, wind, temperature plus and additive, reversible props. Here too, if all functions as envisioned on paper, the modern transport can get stopped on the runway. If one or more props fail to reverse—something else. Truly the whole business of the T category is a "slip-stick" arrangement devised by non-pilots to justify maximum loads. The definition in the Industry is "calculated risk." The question then is: Who is calculating and who is risking? One conclusion is obvious. The critical temperature is not always outside the cockpit.

His Hands Full

As a small boy, I used to marvel at my Grandma's capacity for doing several things at one time. She could rock the baby with one foot, knit, rock herself and dip snuff, all at the same time. Admittedly she was good, but consider the transport pilot on a routine instrument approach. He directly watches: airspeed, altimeter, glide path, localizer, compass, artificial horizon, two radio marker pointers, three marker beacon lights, power settings and engine instruments. At the proper time he must lower the flaps and gear, extend the landing lights and look for the runway. All the while he is listening to the tower giving directions and instructions plus the radar advisory dialogue. Busy??

'The Trouble He Has Seen'

The work load can be even greater at times enroute. In an ADIZ, a pilot must stay in a narrow corridor at an assigned altitude, else expose himself to an intercept by the Air Force. It is reassuring to know we have this network on the alert for the enemy. However, thunderstorms and icing conditions make certain routines untenable. It is not always easy to advise the ground where and how far it is necessary to deviate. If a request in altitude change is made, the ground reply is "stand-by." As yet, there is no approved method to make an airplane standby. If an engine fails or cabin pressure goes, that "standby" routine is even more complicated. It has happened. Pilots may always use emergency authority. Any use of which entails letters of explanation to the Sunday morning Quarterbacks.

Other minor distractions can stem from the cabin. The hostess always has a few queries like: Where are we? How late are we into Chicago? Will we connect with AAL-805, UAL-620, CAL-40, BNF-116, TWA-94, or Lake Central No. 1? Can you order two wheel chairs? Or she may advise that she has run through the complete check list on handling some drunks. The last item on the check list is to tell the Captain. The Captain is supposed to diplomatically dissuade the offender from insulting fellow passengers, kicking out windows, or setting fire to the plane. Management maintains that serving liquor is part and parcel of the transportation picture. One large carrier even polled its customers and found that those making returns, 80% wanted whiskey with the ride. The pilots were not polled. They are just supposed to hogtie the unruly. Anyone that has had occasion to reason with a drunk will get the pitch.

Then, too, throughout the flight, the Captain is supposed to do a public relations job of "fear not for I am with thee." A pilot's description of flying is "hours on hours of monotony punctuated by moments of stark terror." Apparently, the only people afraid of airplanes are the pilots. That is as it should be. Contrary to popular concept, we are all cowards and will turn tail when things get too tough. Experience has made believers of us. All pilots are familiar with the 180 maneuver. Remember, we are in the end that hits first. If the front end gets there safely, chances are the rest will also. The work load on the pilot must not be so heavy as to dim the perspective.

The Airways Boys

Ostensibly pilots report to the airdrome one hour prior to departure to study weather and file a flight plan. When there is weather involved, chances of getting the route and altitude as filed are two-fold—slim and none. The airways boys are doing the best they can with the tools given. I do not wish to be critical of them, but they have devised some sly techniques that makes their work easier and the pilot's harder. Instead of getting a clearance on the ground before takeoff, you get cleared to some obscure local holding fix. This fix may or may not be found on the charts in your navigation kit. They being, VOR departure, RF departure, RF enroute, Company enroute, VOR holding, RF holding or on an approach plate of one of the six-let-down procedures for that field. It could be located in the material found in a locked strong-box located somewhere in the cockpit. This necessitates a pilot leaving his seat in quest thereof. When one gets to the first fix, he may get cleared to another less than five minutes away. The search goes on. Eventually you get a clearance on a different route at an unwanted altitude providing you successfully break through the "chatter barrier." Then the cockpit is overflowing with maps, charts, computers and related articles in figuring a new flightplan. "See and be seen" must be abandoned for the time. This treatment is called preferential routing. Not a preference of the pilots for sure. A clearance can always be refused if one doesn't mind being left suspended in mid-air for indefinite periods. There is a strong compulsion inspired by management to prevent tardiness. Pilots have been grounded for not being in the cockpit fifteen minutes prior to scheduled departure time. Competitive schedules demand the maximum speed

Questions On Loss Of License Answered

Certain questions are constantly reoccurring concerning the Loss of License Disability Plan. It was thought that a short review of the most frequently recurring questions and the answers to them might be of interest.

▶ The question asked most often is, *"Must a pilot actually lose his license to qualify for a claim?"* And tied in with this question is the question as to whether "Loss of License" will pay if the Company doctor says the pilot cannot fly while, at the same time, the CAA says the man can fly.

These questions cannot be answered in plain yes or no fashion, because each claim stands on its own merits, but we can tell you that based upon the claims being paid and under investigation thus far, the above questions have not presented any problem. The reason is that during the fourteen-month disability waiting period, the Underwriters have an opportunity to make a complete investigation by checking with the pilot's own doctor, the Company doctor and the CAA medical authorities. After such an investigation, the evidence is fairly clear as to whether the man has a disability which qualifies under the contract.

If a pilot has a qualified disability under the contract, there is no question but that he cannot pass his CAA physical. The actual revocation of the license by the CAA is, generally, a foregone conclusion even though such revocation is not a prerequisite to collecting benefits under the contract.

In no case being paid thus far, has there been a conflict between the Company medical authorities and the CAA medical authorities or doctors selected by the Insurance Company. This is not to say that there won't be a conflict in the future, but we can say from present experience that the question seems to be given importance way beyond its actual weight in the administration of the Loss of License program.

Several claimants have been denied benefits under the contract, but in each case the denial has been either because of a history of disability which existed before the pilot signed his application or because the claimant did not have a qualified disability.

▶ Another oft-asked question is, *"How and when to apply for benefits under Loss of License?"*

The answer to this is that the pilot should give notice to ALPA within six months from the onset of the disability . . . that is, the last date the pilot flew.

Upon receipt to such notice, ALPA will furnish the pilot with a Preliminary Notice of Claim which he should send to the Underwriters. This Claim form bears the Underwriters name and address.

Some other questions and pertinent facts about Loss-of-License Disability Insurance are:

▶ *Who is Eligible?* (a) All active and apprentice members of the Association in good standing, and in good health, and less than 60 years of age are eligible. Also eligible are executive and executive inactive members in good standing who are maintaining their licenses in good standing by meeting required medical certification by the CAA. (b) The revised ALPA policy on Loss of License eligibility provides that a member retains his privilege of joining the Plan up through the 18th month from the date of his active membership.

▶ *When can members apply for Loss of License?* The Insurance Plan shall be reopened during the month of July, 1956. Coverage will become effective August 1, 1956, to all approved applicants enrolling during this period.

▶ *Loss of License Premium Accounting.* As of 1956, all Loss of License was placed on a November 1st renewal date so that in the future, each pilot's insurance comes due on November 1st, and he will owe a full year's premium from that date. Of course, new pilots who enter the plan after November 1st of each year pay a pro rata premium to November 1st of the following year at which time they owe a full year's premium for the next year.

▶ *Rate of Premium.* $23.50 per year for $500 monthly coverage; $12.25 per year for $250 monthly coverage.

▶ *Maximum Benefit:* $17,000.00.

out of man and machine. One major airline (guess who) has a policy that its pilots go VFR even in marginal weather. They get cleared to "on top" and the devil take the hind-most. Such good clean competition is aiding in developing a file on mid-air collisions.

Crash Story Star

No great skill is required to become an unwilling candidate for the lead role in a crash story. Our engineers have some of the modern transports so arranged as to make it easy. Within seconds after a generator failure, electric-driven pumps, radios, flight instruments, lights and engine instruments give short notice of a work stoppage. Try flying at night on instruments with a flashlight and magnetic compass as your only aid and comfort. It is sporting to say the least. No satisfactory explanation has been given the pilots for the removal of those good old-fashioned wind-driven flight instruments.

Then too there are the preferential runways. Here again not the choice of the pilot and oftimes not into the wind. They are used in conjunction with the noise abatement program. Pilots have been jailed and had to show cause why their license should not be lifted because of the racket made by the plane. The carriers meantime have removed the exhaust rings and replaced them with short jet stacks. This conversion produces a little more speed and lots more noise. So we use runways at times not prompted by length and wind, but to retain a job. The calculated risk can be expanded as the need requires.

The monkey is squarely on the pilots' backs. The law demands that the Captain be responsible for every phase of the flight even to the loading of the ship. There are about ten pounds of manuals and regulations that expressly place this responsibility. Yet more and more there is a grab for authority to direct and control with a total lack of relish for responsibility.

No Benefits

As stated, no offense is intended. It is hoped that by directing attention to a condition, corrective measures will be taken. Pilots should share in benefits that should come with technological improvement. They still must fly up to the maximum of hours as set in 1934. Consequently, as planes get faster, they make more and more trips per month between division points. This gives less and less time at home, hence added exposure. In 1954, the CAB displayed an alarming lack of judgment by issuing a waiver to the 8-hour daily flight time limit. This waiver was to apply only to flights of a non-stop character. Pilots on non-stops could be scheduled up to ten (10) hours per day with no intervening rest period. Curiously enough, the reasons offered were that ten hours of non-stop flying was more restful, safer and desirable for pilots rather than eight (8) hours of flying having intermediate stops. Just like asking boxers to go ten rounds with no rest instead of eight rounds with a minute rest between each round. It is only fair to say that the pilot members of the board issued a dissenting report.

The Jets Are Coming

And now the Jets are with us! Management and CAB must recognize (as pilots do) faster and heavier planes impose greater workloads in the cockpit. There must be some mileage increase formulae that will afford the pilot no greater strain than imposed by propeller-driven craft. CAA and ATC must revise its antiquated flight rules. Ships must be proved airworthy prior to certification. The practice of certification and then grounding to correct has lost lives and money. The manufacturers must divorce the complicated and embrace simplicity. Commercial aviation being in competition with only itself, has no excuse to progress on other than a safe basis.

So long as it is necessary to have men at the controls, all in the industry must realize that a pilot with 250,000 pounds strapped to his fanny, flying at 600 miles per hour, is entitled to every consideration. Moving the pay load from A to B is the one and only source of revenue. Others can justify their job only to the extent they aid the pilot. He is making them a living. Gravity has the capacity to prevent a graceful flight termination. It behooves all to take heed—*ere the cockpit overfloweth.*

Washington National Airport's 15 Years

For fifteen busy and dramatic years, Washington National Airport has served the nation, and on June 16, 1956, it entered a second great stage of its history.

The wings of war and peace have used this field, the airport for Washington, sometimes hailed as the Capital of the World. The greatest personages of the world have landed there. History has been made in handshakes and smiles there. And 22,000,000 travelers, mostly U. S. citizens, the real owners of the airport, have trod its concrete ramps.

History Made

Three presidents have written history at the airport. President Eisenhower has not only continued the practice of using a four-engine transport plane for Presidential travel about the world, but he has added a two-engine executive-type plane for shorter and less formal business and pleasure trips. President Truman, before him, followed the precedent of President Roosevelt, who was the innovator of presidential air travel.

Among the airport users have been the great news-making names of the world in these 15 years. To name a few: Chamberlain, Churchill, King George, Queen Mary, Queen Elizabeth, DeValera, Costello, U Nu, General and Madame Chiang Kai Shek.

Today, on the verge of the jet-powered air transport age, DCA, the teletype abbreviation by which the field is familiarly known among fliers, is operating at capacity. It recorded 225,914 landings and takeoffs in 1955, serving 3,634,951 passengers; during 1942, its first full year, it handled 459,396 passengers and 77,348 landings and takeoffs. Today, Washington is ready for another airport, not designed to replace Washington National, but to supplement it, and to keep pace with the demand which in 15 years has made so great an airport inadequate.

Inadequacy Noted

That word "inadequate" affronts the pride of Washington—and the people of the whole country—when applied to Washington National. Visitors see scores of planes circling and landing, and other scores in orderly columns taxying to takeoff positions and flying away. What they do not see, however, is the badgered traffic manager of an airline trying to schedule more trips into Washington to handle the growing number of passengers who want his airline to fly them there. He cannot schedule more, because under instrument conditions, Washington can han-

dle only so many landings and take-offs per hour. You cannot see the airplanes waiting at Pittsburgh, Chicago, Atlanta and Memphis for word from Washington that they can be landed. You cannot see the airplanes that fly over an airport and go on to alternate fields because the traffic controllers cannot work them into their stream of callers. That condition is what determines adequacy of an airport.

Despite amazing aids for landing, the Civil Aeronautics Administration's airport traffic controllers cannot handle all the planes that want to land at Washington. There were sensational hours in the 15-year history in which the tower handled as many as 68 operations under instrument conditions. But that kind of volume is completely out of reach when extended periods of bad weather put instrument flying rules into effect.

Origin Traced

Origin of Washington National was dramatic. The Capital was watching its air traffic outgrow a small field called Washington-Hover, just across the Potomac river, on the site where the Pentagon now rests. The field was fast becoming inadequate. Scores of sites were proposed, criticized and dropped. Hundreds of letters were printed on the editorial pages. Various interests pulled and hauled—as they have pulled and hauled since the airplane first needed a place to land—and the Washington stalemate was complete.

Then President Roosevelt cut Washington's Gordian knot and said, "Put it there!" pointing to Gravelly point on the south bank of the Potomac. "There" was only three and a half miles from Washington's downtown area, a uniquely convenient location for any major air terminal. That time-saving convenience will keep it as the point of arrival and departure for the many short-haul travelers to Washington, even when a second civil airport goes into operation there.

Construction was interesting. Engineers said there was enough gravel on and under Gravelly Point to make 80 such airports. The Potomac and the Anacostia had been manufacturing and storing this gravel for geologic ages, and all the engineers had to do was to get it up off the bottom, dry it out and put some surfacing on it. To do this, they built a dike around some 500 acres and began pumping gravel from the river bed into this space. Huge dredges pumped away for months and the outline of the runways began to appear. There came the day when the doors in the dike were opened and the water began to run out and the resurrected gravel began to dry out, and settle down to what is probably as firm an airport foundation as any in this world.

"She's gravel right on to China—nearly" as one workman put it. There has never been the slightest suggestion of subsidence of buildings put on this foundation, and maintenance of the landing area has been minor.

Dedicated In 1941

Came another day when great things happened at Washington National, the day it was dedicated, June 16, 1941. Top figures of administration, business and diplomatic circles were there, while war clouds were forming over the United States. The celebration featured a great aerial display, with fighter and bomber planes rendezvousing over Washington in split-second timing. Many a citizen that day shuddered at the aerial might that roared, now from the East, now the South, and now the West, over the throngs awaiting the dedicatory words. None knew how soon those war fliers would be converging over war targets, and none imagined how horrifying those planes above them could be in real war.

From the beginning the CAA considered Washington as a model airport. All of its developments for airport improvement were installed at Washington as soon as they reached the stage of practical application. It was a handy place for gaining the user's reaction on new ideas for lighting, new aids for landing, new items for plane handling on the ground, and even new ideas in handling passengers. As a result, the field has been in the up-to-the-minute aeronautical category all the years of its life.

Earns Its Own Way

Very soon after the mud of construction days settled down, and the airport began to gain in beauty, the tourists discovered it, and the management started on a successful campaign to make the airport support itself. First income came from the dimes which visitors put into the turnstiles leading to the observation platform. From there the concessions went in all directions. Today they call the Administration Building "Benny Griffin's Midway," an indirect compliment to the airport director, Bennett H. Griffin, who can point to a record of 15 years when the total income at the field has been greater than the money appropriated by Congress for its operation. Along this "midway" are dozens of businesses, there to serve the needs of travelers, to feed and even clothe them, and to help them while away an hour of waiting. The dimes and dollars roll in, and straight through the airport's coffers to the general fund of the treasury, but the CAA never fails to tell Congress that the airport "made its way."

In the 15 years, Congress has appropriated $13,407,000 for operation of the airport. In those years, the income at the field has totalled $25,380,000. Originally, the airport cost the people some $16,000,000 and various additions such as hangars, additional terminal building space and various facilities for handling planes and passengers have increased the capital investment.

It is the only civil airport in the United States operated by the Federal Government.

WOMAN

(*From* THE AUSTRALIAN AIR PILOT)

SYMBOL: W.O.

ATOMIC WEIGHT: 120 lb.

OCCURRENCES: Found wherever man is seldom in a free state.

PHYSICAL PROPERTIES: Generally rotund in form. Boils at nothing and may freeze at any time. Melts when properly treated.

CHEMICAL PROPERTIES: Very active. Possesses great attraction for platinum, gold, silver and precious stones. Violent reaction when left alone. Turns green when placed beside a better looking specimen. Ages rapidly.

USES: Highly ornamental. Equalizes the distribution of wealth, is probably the most powerful income reducing agent known.

CAUTION — Sometimes dynamite.

(*Don't ask us why we printed this—it's just the season.*)

Command Function . . .

(Continued From Page 4)

as captain. He also learns the operative and technical sides of his profession, the skills of pilotage, the airmanship and the weather sense.

The first officer is second in command of the aircraft. A good second in command is a man, who has thoroughly fitted himself for the job above him and who has become more than a right hand to his superior. Such a first officer will be as skillful or more skillful, than

his captain in the control of the aircraft, will know everything about the airplane, the route, the procedures and the regulations. He will fully understand his subordinate position, will obey willingly always and never fail in respect. And finally, he will stand ready to take the initiative when to do such is clearly indicated. Does this seem an unrewarding part to play? Not so! This is the part of an executive officer, a number one—not a mere helper, but a highly valued partner.

Sometimes, when first officers become overdue for promotion, they lose interest and get very fed up. Remember that men who fly, however long they stay at it, are always able to learn something they did not know before. Impatience and frustration can make the mind unobservant and unreceptive, thereby allowing valuable experiences to pass by with no lesson gained. But, true as this is, sympathetic captains can help such first officers greatly, if, aware of their competence, they will delegate more to them than they usually do.

Assuming Command

A possible but unlikely experience, which may be thrust on a first officer is that of having to take command due to the incapacity of the captain. This is interesting more from the standpoint of the relationship of command than from actual necessity, and it might occur in either of two ways. Most likely is the situation, where the captain collapses completely due to sickness or accident. The other is where it seems very evident, for the safety of the flight, that he must be made to change his actions, or, failing in this, be relieved. This problem presents a man with one one of the most difficult of decisions, one so interesting in its possibilities that it has been theme of several recent, excellent books. In "The Caine Mutiny" the first officer relieved his captain in a typhoon and was shown to be very wrong in the court martial and subsequent proceedings. These books are very interesting reading and while fiction, are instructive to anyone who wishes to be a pilot.

In this chapter an effort has been made to explain to some extent some of the command problems which a captain and his first officer encounter in their normal life of operating flights. Much more could be written, for, when the subject of command is contemplated, many seemingly unrelated and involved subjects become pertinent. It is hoped that this will provoke thought, serve as a guide to the uninitiated and as a reference to men of experience.

Specifics For A Useable ATC System . . .

(Continued From Page 7)

in advance? SC-31 in 1948 concluded that it was "essential" to establish "individually distinct lanes over which normal traffic must flow. . . ." In 1950 SWG-5 was less explicit. Today the question of "route control" as opposed to an "area concept" of control is up in the air as far as accepted policy goes.

I firmly believe that the route concept is a fundamental requirement in high density areas. I believe that organizing traffic on a system of discreet routes is the first step toward orderly control of the complex traffic movement in an area like New York. And the more traffic the greater the need for organized routing.

The needed Automatic Air Traffic Control System should be based on a route concept. This basic policy can and should be superseded by control on an area basis in special cases when required to dodge a thunderstorm or to handle an emergency. Furthermore, it is recognized that the military must conduct certain operations on an area basis. An intercepter after a bogie for example.

Under the proposed operational philosophy, the few civil and military flights that must be handled on random tracks can be handled by manual override of the automatic system.

SAGE's Role

Where military flights are directed by the SAGE computer on random tracks, such operations can be electronically coordinated with the air traffic control system. The SAGE computer can "advise" the ATC system computer automatically which blocks of airspace will be invaded. The ATC system will instantly and automatically direct traffic out of these blocks of airspace and prevent further civil traffic from entering the reserved area until the military emergency is over.

Final Points

▶ The seventh principle governing airspace use recognizes the logic of using oneway airways, overpasses and underpasses and recognizes the obvious value of segregating traffic by speed and performance category. I believe these points are so self-evident as to need no further explanation.

▶ The eighth and final principle is not self-evident. In fact, the usual thought of most people leans to the contrary view. After 15 years of study and analysis, I am more convinced than ever that the right and best way to keep flights safely separated in an air traffic control system is on the basis of reserving chunks of sky ahead of the flight as it moves. I believe it is impractical and unsafe, in a high density operation, to clear an aircraft into an airspace on the hope that such airspace will later be clear. The airspace should be reserved before the pilot is told to go there. This is the fixed block separation system spelled out by RTCA Special Committee 31 in 1948.

I believe this requirement is fundamental. I say "fundamental" because you can build an operationally acceptable control system on this basis. Contrarywise, no so-called moving block control system yet proposed has been found operationally acceptable.

A control system that relies on fixed blocks (blocks big enough to hold in) for safe separation is inherently capable of fail-safe implementation. A moving block control system is inherently incapable of fail-safe implementation.

N. Y. Area Problems Of 1975

Up to now we have stated the operational requirements that must be met. We have set forth sound principles to guide development and implementation. It is next necessary to determine whether a system built in accordance with these principles will have the capacity and flexibility necessary to allow expansion into the future. Realistic numbers must be applied to determine whether there are dead-end streets hidden in the fine sounding philosophy.

In order to make this determination I am currently studying what the scientists call a "model problem." I have studied the air traffic problem anticipated in the New York area of about 1975. In setting up this model problem I have chosen to work with a total theoretical capacity of 540 operations (in and out) in a peak hour. This is divided into 120 operations per hour at each of the three major airports of the area and 60 operations each at three minor airports. In this model problem the anticipated distribution of traffic by routes and by types of aircraft have been estimated by the most qualified experts in this field. The anticipated short period fluctuations in these figures have been estimated and the necessary routes and altitudes have

been provided for peak loadings on each route.

In this study airspace blocks for safe separation were given the following dimensions: Length—12 miles; width—6 miles; and height—1000 feet. There is at least one navigation system currently in use that will allow safe holding in blocks of this size. I am assuming that the navigational information is pictorially presented to the pilot. When flying above 160 knots, flights will be protected (airspace will be reserved) a minimum of two blocks ahead.

It is felt that the theoretical figure of 540 operations in a peak hour is equal to or higher than the peak demand expected in 1975. Considering that all runways at the six airports would not be loaded to maximum at the same time, a figure of 400 operations per hour is estimated to be the practical capacity of a system having a theoretical capacity of 540 per hour. Best estimates of probable traffic demand in the New York area for the year 1975 fall around this figure.

Predictions Stated

This study is not yet complete. Preliminary findings, however, make it reasonably safe to predict the following:

▸ **No delay will be added by the control method itself.** In other words, no delay is added to any flight just to make this system work. The only delay will be occasioned by an excess of demand on the system over and above capacity of the system.

▸ **It appears that flight mileages may be less than present.** Extra flight mileages may average less than the extra flight mileages required on the present IFR routings in and out of the New York area.

▸ **Aircraft will fly the way they want to fly.** In the model problem study it now appears that nearly all flying in and out of the New York area can be done within the best performance capabilities of the various types of aircraft. Climbs, descents, cruising speeds and altitudes are allowed within the normally desired ranges. Further than this, the system can accommodate requests that fall outside these normal ranges. For instance, a pilot may want a lower altitude through an area of thunderstorms.

Simulator To Prove Study

Fortunately it is not necessary to rely on a paper study. A special purpose simulator can be built within an estimated four months. This simulator will cost approximately $35,000. Built to simulate the most critical segment of the New York area of 1975; this simulator would cost little to operate and could provide a large amount of data in a matter of weeks.

With such a special purpose simulator, the limits of system capability in meeting a wide range of operational demands can be plotted. I am confident such simulator will show that properly organized traffic will flow smoothly through the fixed blocks of the safe separation element of the system. I believe it will show that the sort of system proposed has all the expansion capability necessary to carry us into the foreseeable future.

Summary

May I restate my firm belief that these principles and requirements could be examined operationally and mathematically and validated by the interested agencies within six months. A simple, first stage implementation of this philosophy with hardware would break all existing bottlenecks for several years to come. The needed first stage implementation can be built now and can be designed for the necessary integration with the SAGE defense system. The control machine, and all air and ground elements essential to the first stage implementation could be ready for initial flight testing within one year from the day decision is backed up with money.

Serving The Insurance Needs Of Air Line Pilots Since 1937

SCHIPPLOCK SALVESEN

INSURANCE CONSULTANTS
CHICAGO MIDWAY AIRPORT
POrtsmouth 7-6838
4848 W. 63rd. St., Chicago 38, Ill.

T. S. BRIDGES
P. O. Box 10116 Oaks Branch
Fort Worth, Texas

Please place my name on your mailing list to receive information on *Oil Drilling Prospects* for my consideration.

NAME.....

ADDRESS.....

CITY.....STATE.....

PRICE SCOOP TOP QUALITY FLIGHT BAGS

YOU SAVE $12.00
Unprecedented Underpricing!

Finest top-grain cowhide —Heavy duty zipper— Steel frame reinforced —Reinforced corners— Heavy brass zipper lock —Extra strong bottom —SERVICE TESTED on rugged airline runs.
Open at the top— IT STAYS OPEN.
MODEL 5-806

Built with 3 roomy compartments to meet all pilot's needs. Perfectly balanced design. Beautifully finished. Black, brown, tan and ginger.
Size 16" x 7½" x 11½"—"Scoop price" $19.95
Size 18" x 8½" x 12" —"Scoop price" $22.95
All prices plus 10% Federal tax. $1.00 shipping, or f. o. b. Ft. Worth. 3-day examination guarantee
FRANK SOUTH LUGGAGE
Airline Employee Supply
3901 Clayton Rd. W. — Ft. Worth 16, Tex. — Dept. P.

Your Rendezvous At Chicago
Announcing The Opening Of Private Room Catering To Banquets And Parties
THE AIRPORT PINES
Across From Midway Airport
4739 W. 55th Street
We Specialize In Sizzling Steaks

ALPA MEMBERS:
write for free catalog
special membership discount
nationwide shipments
GERRY MOBURG & CO.
furniture - carpeting - appliances
2539 w. peterson rd. UPtown 8-7350
CHICAGO, ILL.

VISUAL TRAINING
OF COMMERCIAL AIR LINE PILOTS
To Meet Eyesight Requirements of Periodic Company and C.A.A. Exams
DR. JOHN T. FLYNN
OPTOMETRIST - ORTHOPTIST
Visual Training Specialist
300 W. 23rd St., New York City
By Appointment Only WA. 9-5919

ALPA's Modern Home Office Lobby

Colorful Mural On West Wall Of ALPA's Home Office Lobby.

Many of the thousands of pilots and other visitors passing through ALPA's Home Office's modernistic lobby each year, are struck by the colorful mural dominating the foyer's entire west wall. Many have asked for more information on this impressive piece of art.

Before Chicago-born artist Berry Horton started on his semi-abstract painting, he took into consideration the lobby's clean uncluttered yet austere design. Cold in line and color, with grey terrazo floors, limestone walls, glass and aluminum, it called for a brilliant yet aeronautical work, keeping in the spirit with ALPA's functions. He decided on a design of aviation forms from ancient to present days with a glimpse into the future.

Here Horton's background in engineering complemented his art training and captured much of the spirit of aviation. The mural symbolizes also the pilot as the public sees him: colorful, daring, master of the mysteries of the air and machines.

The colors used are true and brilliant, and have been picked up in the lobby's upholstery and drapes. Even the furniture has been selected to further the modern, alert air imparted to the lobby by the mural.

39-year-old Horton is a shy and quiet man, who spends most of his time at Chicago's Art Institute, where he studied for about six years, and is presently employed as an Assistant. At one time, he planned to become an engineer, having enrolled as an engineering student, but later switched to his one great love: art.